Adaptation to Wildfires in the West: Linking Science to Action

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Desert Research Institute

CLIMATE ECOSYSTEM FIRE APPLICATIONS

United States
Department of
Agriculture

Forest Service

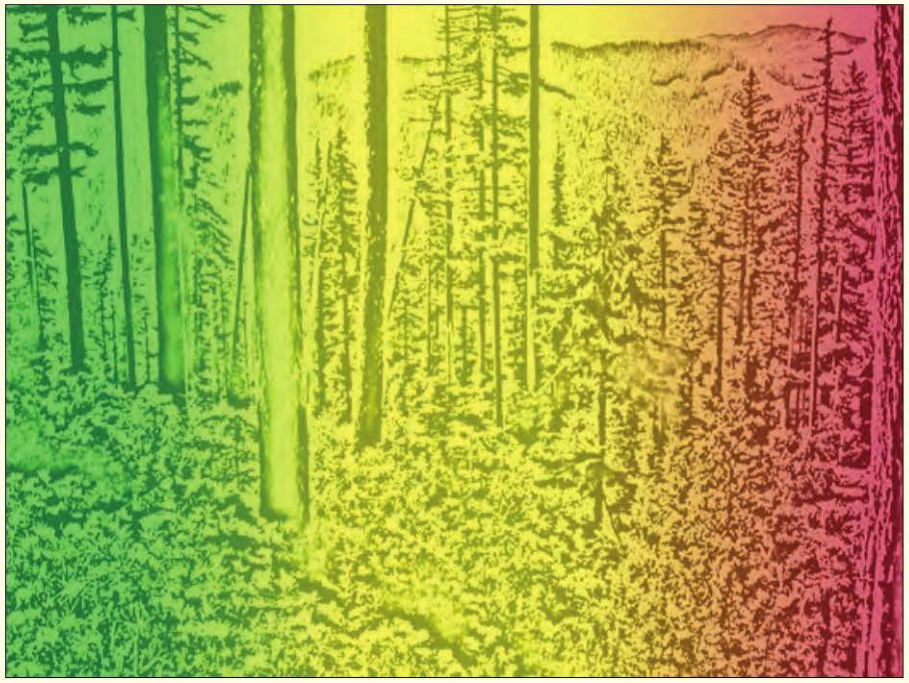
Pacific Northwest
Research Station

General Technical
Report
PNW-GTR-870

December 2012

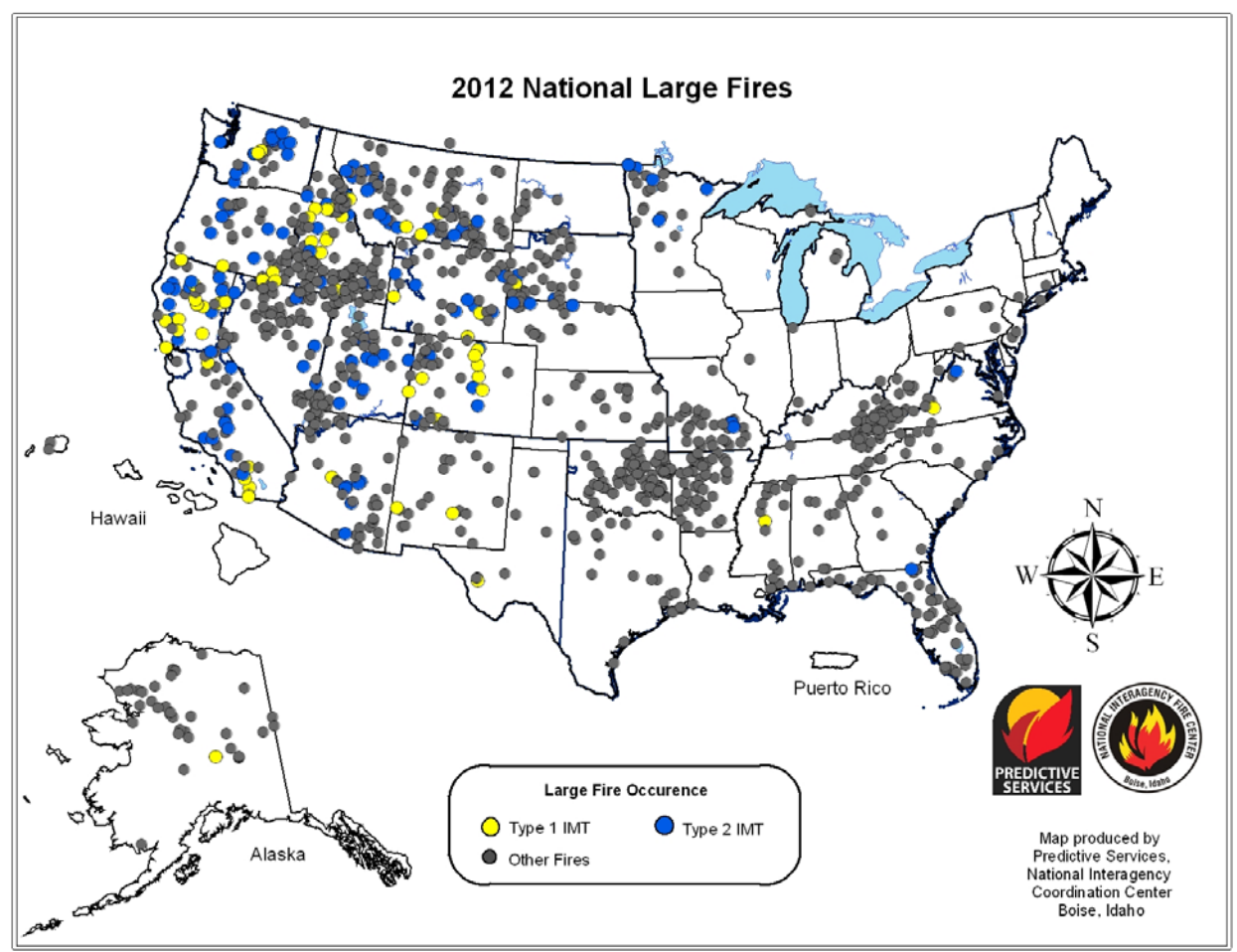
Effects of Climatic Variability and Change on Forest Ecosystems:

A Comprehensive Science Synthesis for the U.S. Forest Sector



Disturbance Regimes

- Wildfire will increase throughout the U.S.



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Disturbance Regimes

- Expanding insect infestations

  Current advance of bark beetles in forests throughout the Western United States and Canada often affecting more land area per year than wildfire

Photo: Western Bark Beetle Assessment 2009

Disturbance Regimes

- Invasive species will likely become more widespread

Source: Patrick O'Driscoll

Disturbance Regimes

- Increased flooding, erosion, and movement of sediment into streams will be caused by:

  - Higher precipitation intensity in some regions

  - Higher rain:snow ratios in western mountainous regions

  - Higher area burned (western dry forests)

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Photo: A. Youberg, AZGS

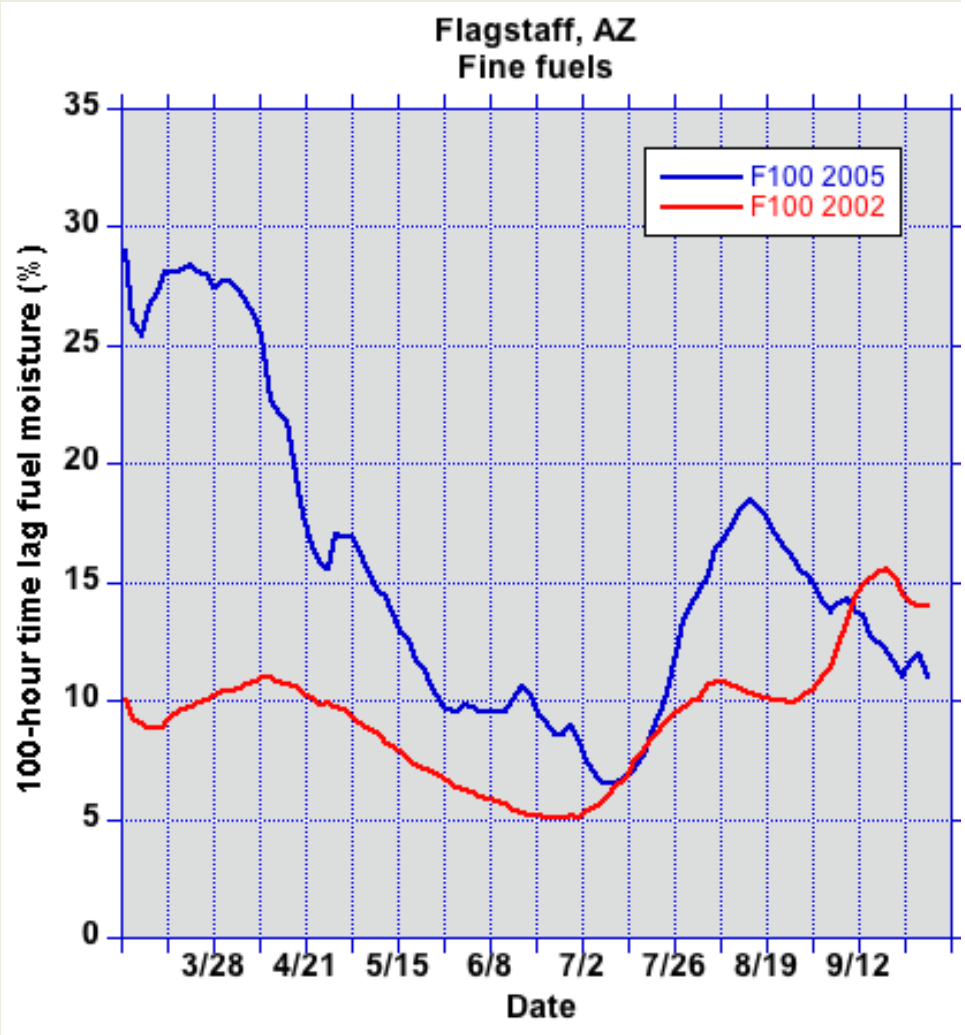
Disturbance Regimes

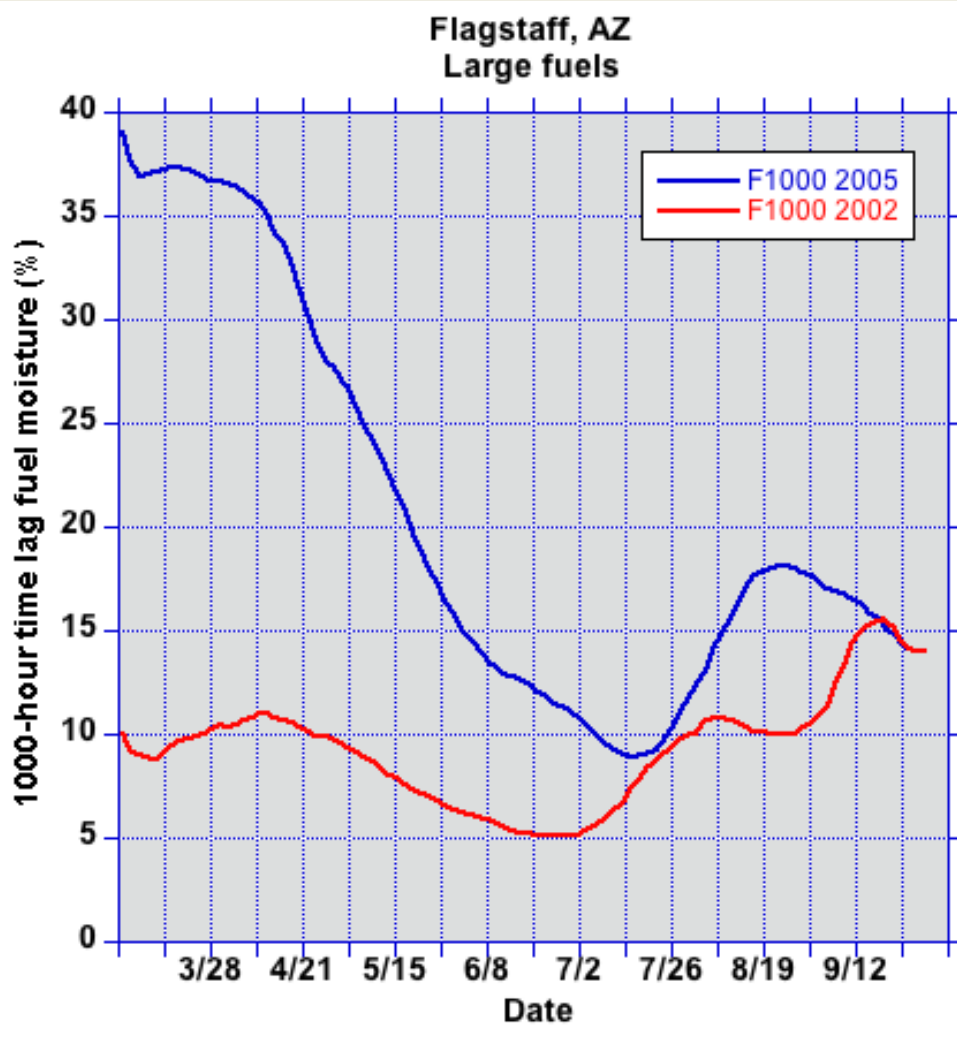
Increased drought will exacerbate stress complexes that include insects, fire, and invasive species, leading to:

- Higher tree mortality
- Slow regeneration in some species
- Altered species assemblages

Photo: Associated Press

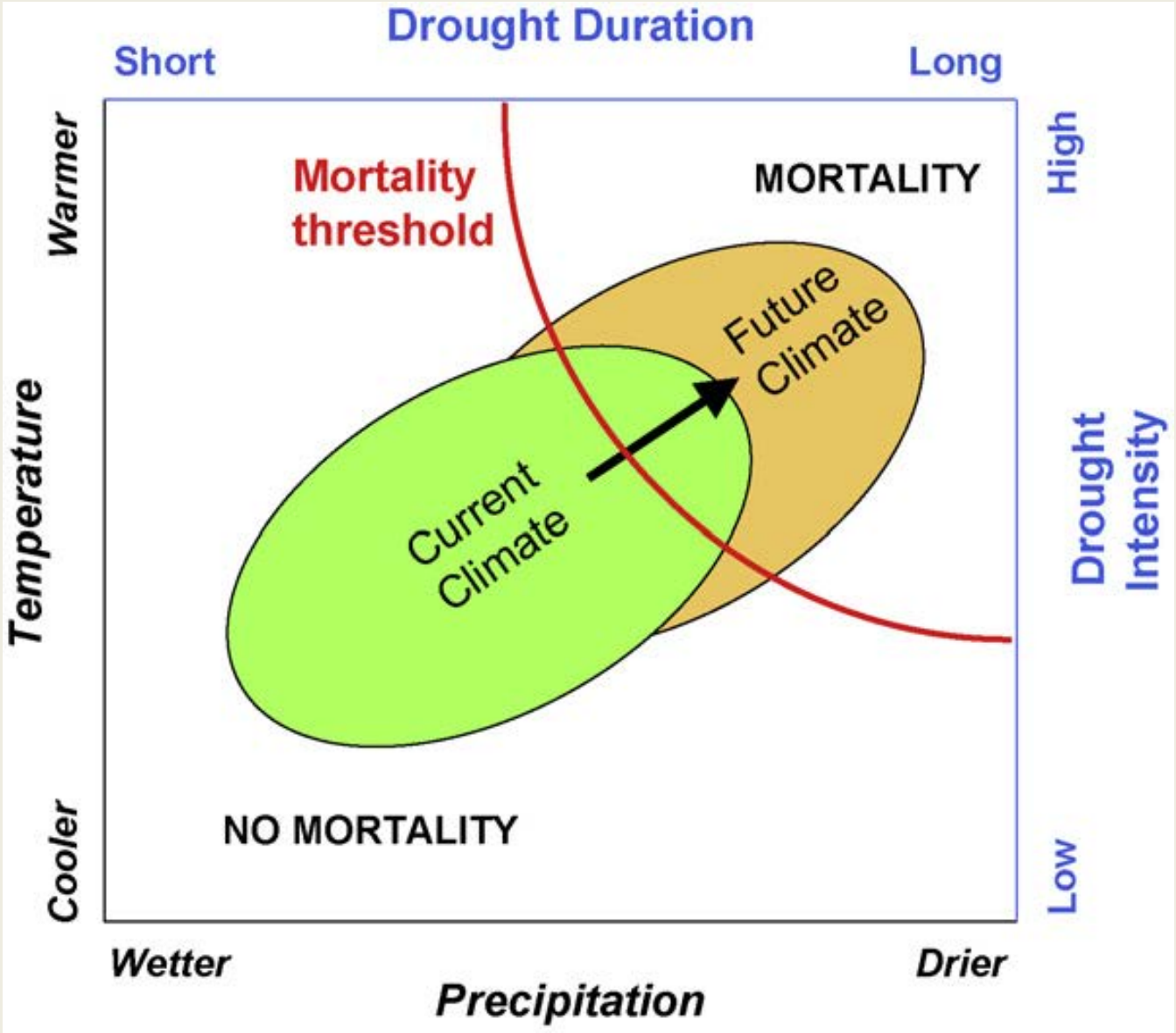
Relation of drought to fuel moisture





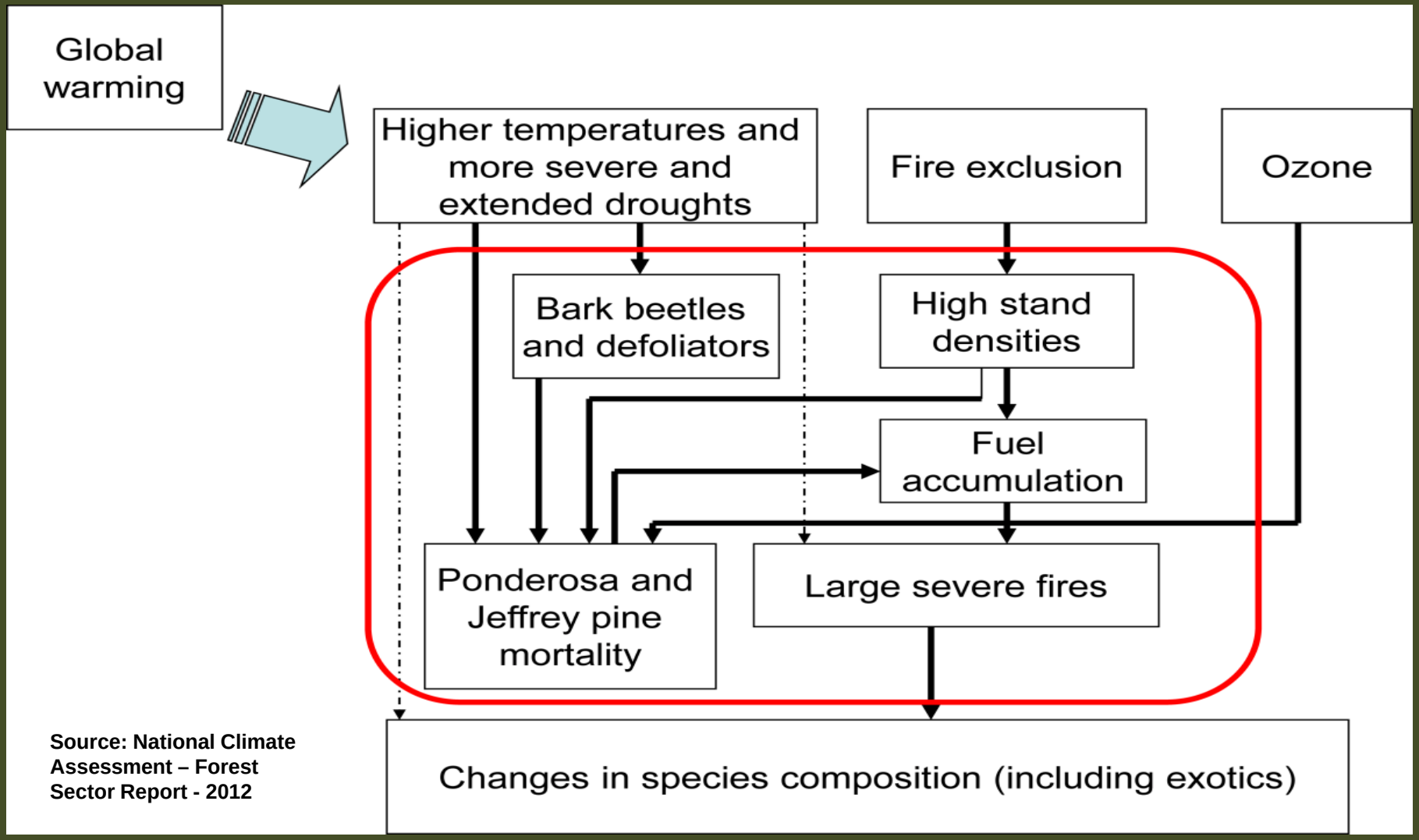
Data source: Chuck Maxwell, USFS

Conceptual diagram of drought and tree mortality



From Allen et al, 2010

Stressor Complexes and System Changes



Source: National Climate Assessment – Forest Sector Report - 2012

Changing Forests...Enduring Values

Courtesy: Dave Cleaves, USFS

Forest Ecosystem Disturbances

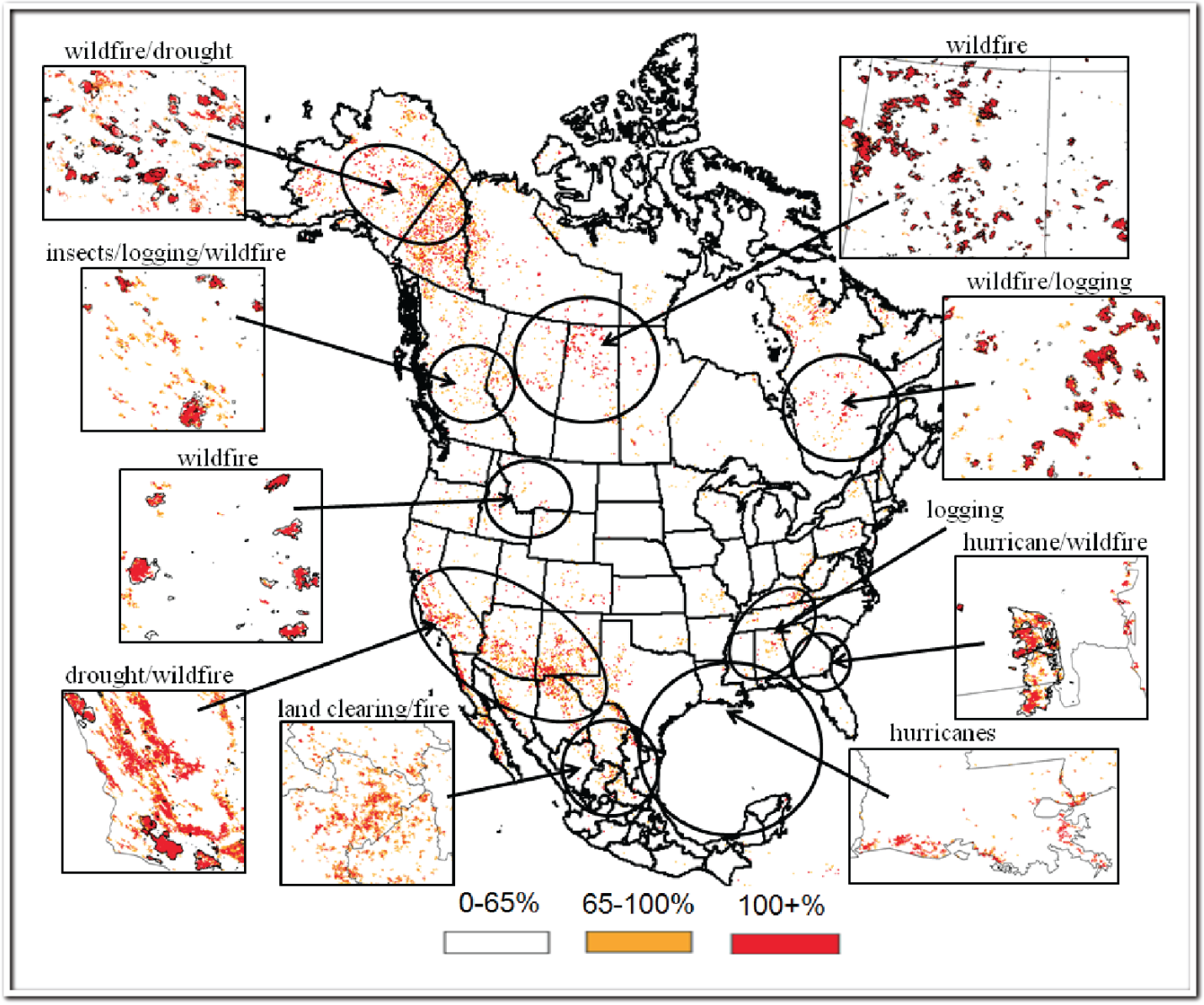


Figure source: (Goetz et al. 2012)

Adaptation options suitable for conditions of forested ecosystems

- Promote resistance
- Increase resilience
- Enable ecosystems to respond
- Realign highly altered ecosystems

U.S. Forest Service initiatives for responding to climate change

- Furnish predictive information on climate change and variability
  - Develop, interpret, and deliver spatially explicit scientific information on recent shifts in temperature and moisture regimes, including incidence and frequency of extreme events
  - Provide readily interpretable predictions at regional and sub-regional scales

U.S. Forest Service initiatives for responding to climate change

- Develop vulnerability assessments
  - Assess the vulnerability of species, ecosystems, communities and infrastructure
  - Identify potential adaptation strategies
  - Assess the impacts of climate change and associate policies on tribes, rural communities and other resource dependent communities
  - Assess the vulnerability of threatened and endangered species and to develop potential adaptation measures

U.S. Forest Service initiatives for responding to climate change

- Tailor monitoring to facilitate adaptive responses
  - Expand observation networks, intensify sampling in some cases; integrate monitoring systems across jurisdictions
  - Monitor the status and trends of key ecosystem characteristics, focusing on threats and stressors that may affect the diversity of plant and animal communities and ecological sustainability
- Align Forest Service policy and direction with the Forest Service strategic response to climate change

Department of Interior Climate Change Adaptation Plan for FY13

- Guiding principles - science

- Ensure that management decisions made in response to climate change impacts are informed by science

- Build or access regional and local capacity to interpret climate science to inform adaptation plans for infrastructure and natural and cultural resources

- Where appropriate, coordinate with other regional science resources in order to inform adaptation plans and actions

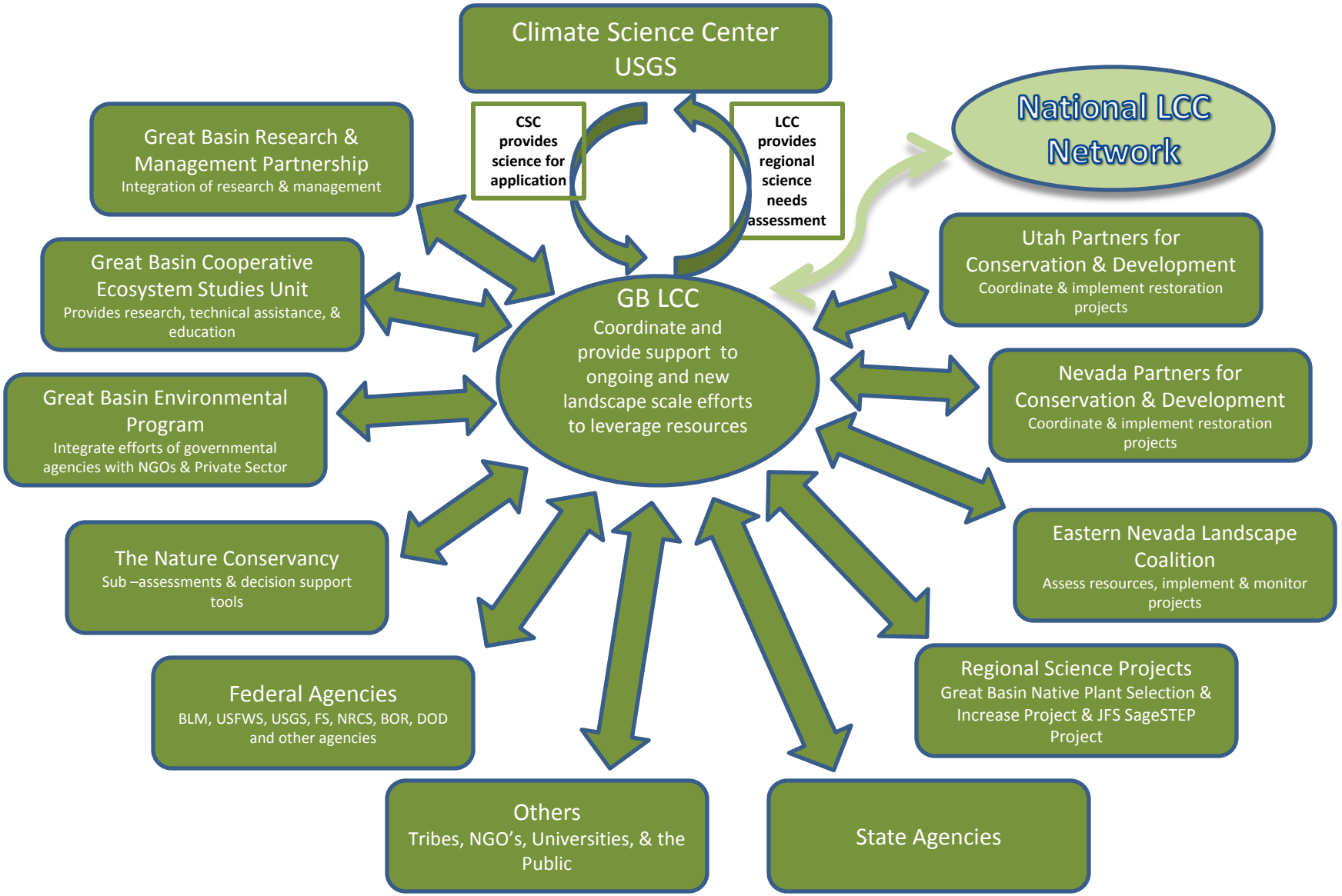
Department of Interior Climate Change Adaptation Plan for FY13

- Guiding principles - science
  - Where appropriate, ensure representation at the executive level on the Stakeholder Advisory Committee for each DOI CSC and the Steering Committee for each LCC
  - Facilitate and support data integration and access to enable broad use of scientific information for management decisions
  - Consider and incorporate Traditional Ecological Knowledge and long-term observational information as data sources

Table 4.3—Climate adaptation guides relevant to the forest sector

Category	Emphasis	Reference
Adaptation framework	General options for wildlands	Millar et al. 2007
	Options for protected lands	Baron et al. 2008, 2009
	Adaptation guidebooks	Peterson et al. 2012, Snover et al. 2007, Swanston and Janowiak 2012
Vulnerability analysis	Climate change scenarios	Cayan et al. 2008
	Scenario exercises	Weeks et al. 2011
	Forest ecosystems	Aubry et al. 2011, Littell et al. 2010
	Watershed analysis	Furniss et al. 2010
Genetic management	Seed transfer guidelines	McKenney et al. 2009
	Risk assessment	Potter and Crane 2010
Assisted migration	Framework for translocation	McLachlan et al. 2007, Riccardi and Simberloff 2008
Decisionmaking	Silvicultural practices	Janowiak et al. 2011b
	Climate adaptation workbook	Janowiak et al. 2011a
Priority setting	Climate project screening tool	Morelli et al. 2011b

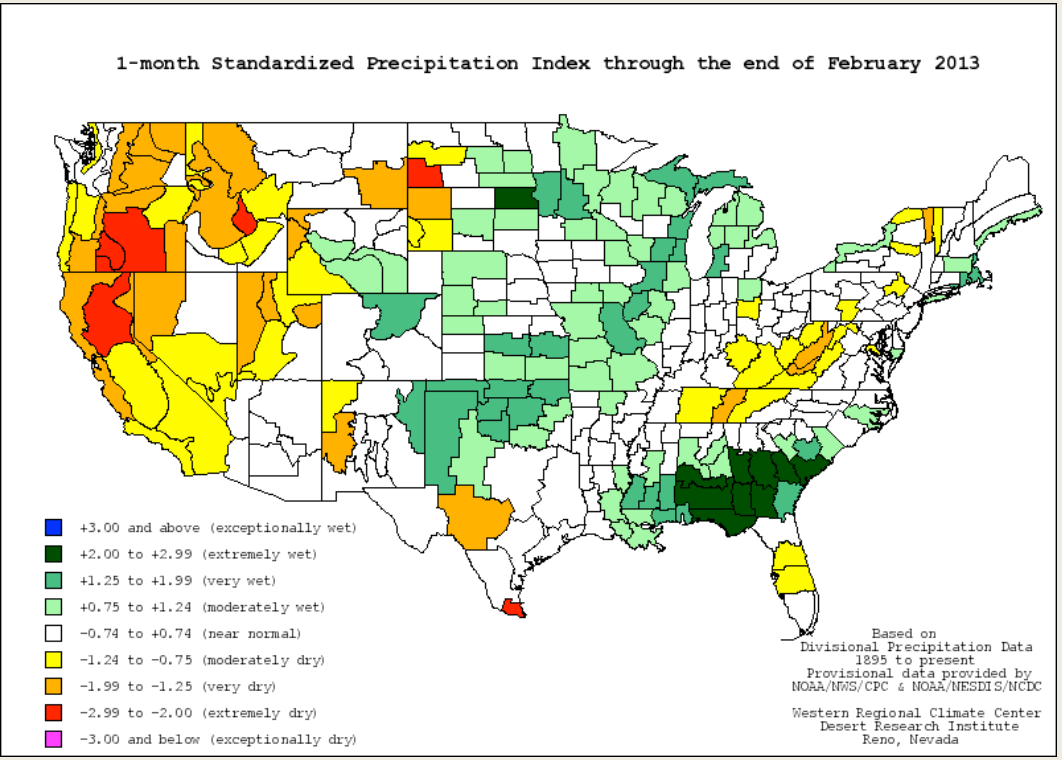
Great Basin Landscape Conservation Cooperative Organizational Concept

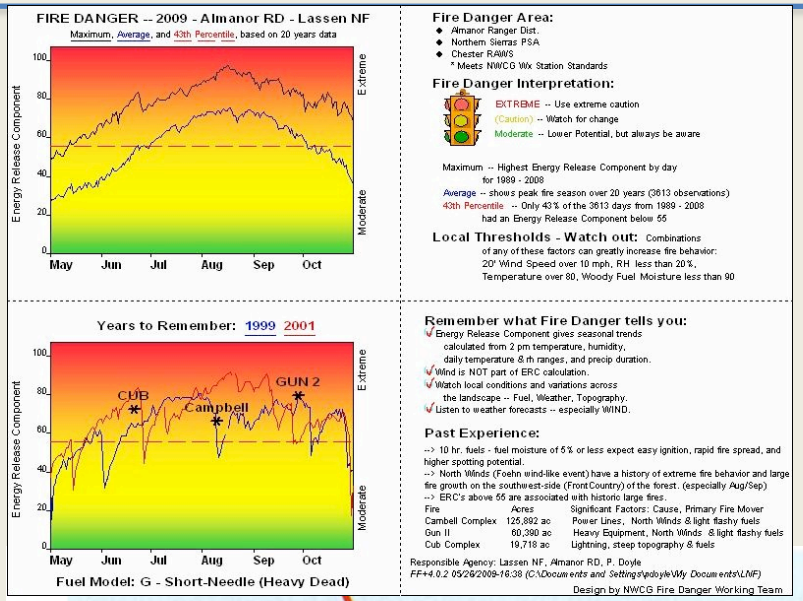


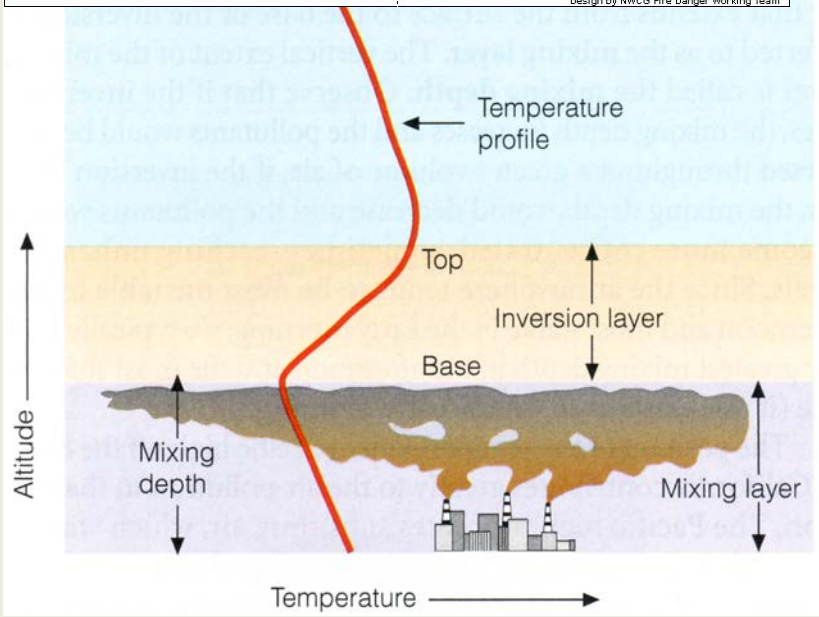
Source: Melvin Tague, BLM

How science gets into things

Tim's world

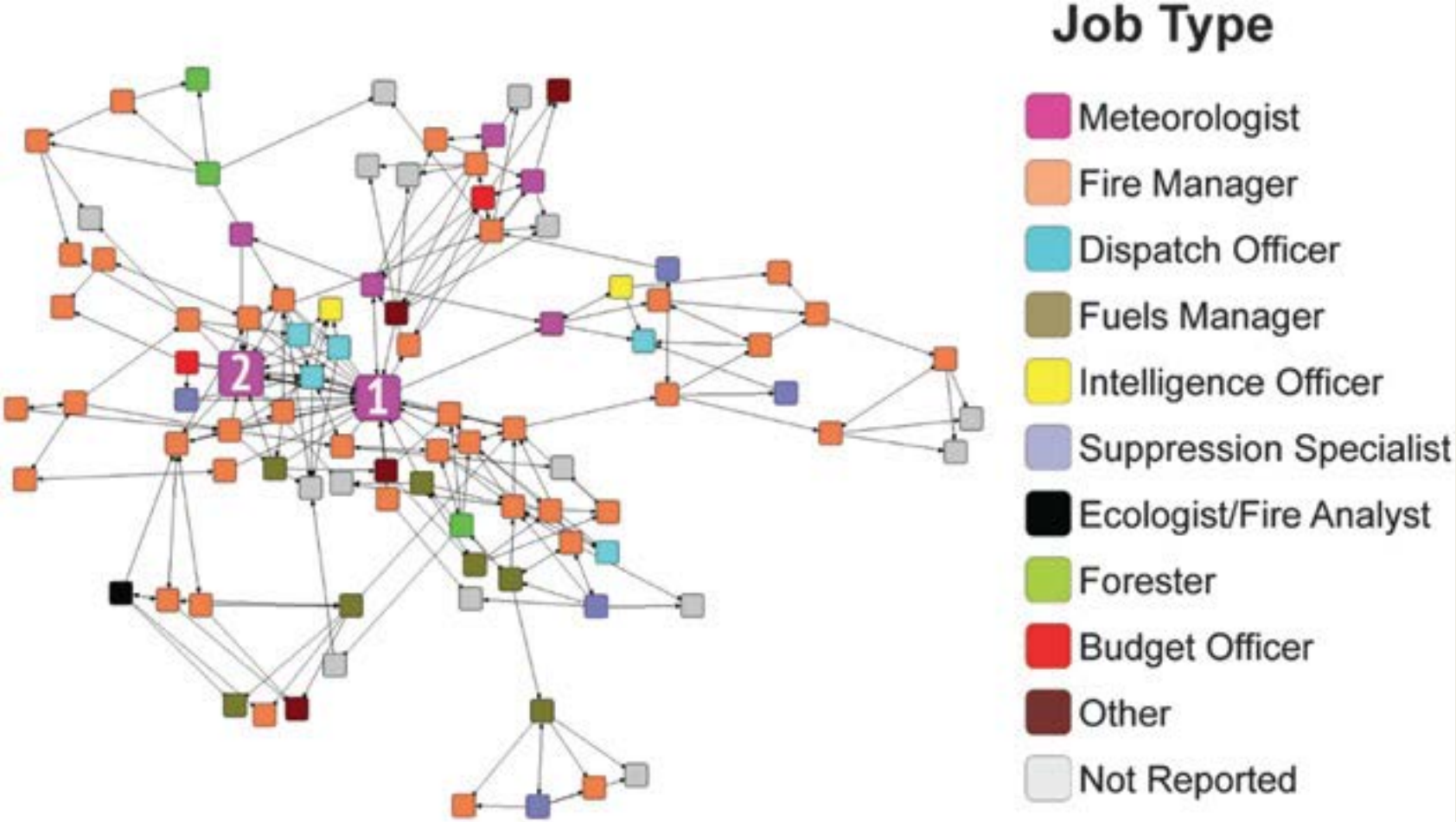


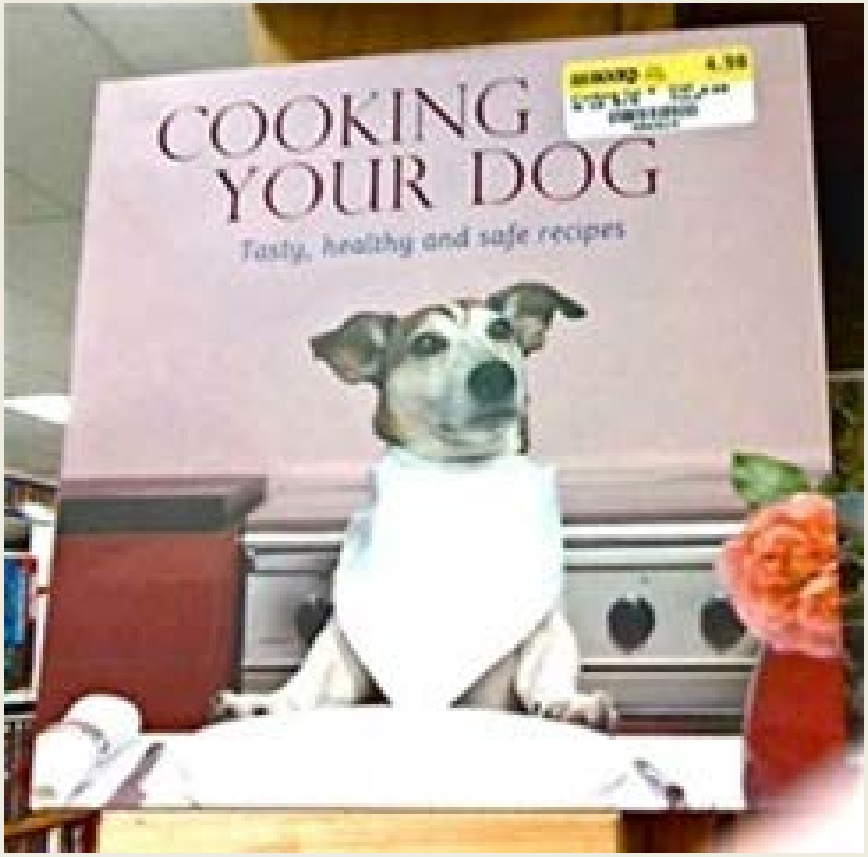




How science gets into things

The knowing





The need for complete information